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Moderate Electric Fields Processing to Modify Whey Protein Functionality: Production of Functional Protein Nanoparticles

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The development of food-grade, biodegradable, edible nano-structures is one of the main challenges for nanotechnology applied to food science and technology and is attracting a great deal of interest in several research areas, such as food ingredients, functional foods and food packaging. In fact, most nano-structures are very versatile, featuring tunable chemical and three-dimensional physical structures, adequate mechanical properties, high water content, and biocompatibility. Moderate electric fields (MEF) interfere with the physical structure and chemical properties of bio-based food-grade building blocks such as proteins and polysaccharides, thus offering a great potential to the development of a new generation of food-grade nano-structures. Application of MEF appears as a novel method for controlling the size of whey protein particles by modulating the balance between attractive and repulsive forces during propagation step of protein aggregation and consequently gelation. Nanoparticles of beta-lactoglobulin were developed and their functionality as vitamin carriers was evaluated. A comparison of their properties was made between the nanoparticles produced in the presence and in the absence of MEF.